SAK CONSTRUCTION
864 HOFF ROAD
O'FALLON, MO

DRAINAGE STUDY

CITY OF O'FALLON
COMMUNITY DEVELOPMENT DEPARTMENT
ACCEPTED FOR CONSTRUCTION
BY: _____ DATE: 9/28/10
PROFESSIONAL ENGINEER'S SEAL
INDICATES RESPONSIBILITY FOR DESIGN

By:
David Mason and Associates
800 South Vandeventer
St. Louis, MO 63110
314-534-1030

Date: September 16, 2010

DMA # 2010003-00

STATE OF MISSOURI
MARK EDWARD DAVIS
NUMBER E-24050
REGISTERED PROFESSIONAL ENGINEER

SEPT 16, 2010

DAVID MASON & ASSOCIATES
CHICAGO, IL • ST. LOUIS, MO • DALLAS, TX

COMPUTATION SHEETS

PROJECT #: 2010003-00
PROJECT TITLE: SAK 864 HOFF ROAD
CLIENT: SAK CONST

COMPUTED BY: M. DAVIS
CHECKED BY:
DATE: 4-6-2011

IS IT ACCEPTABLE TO DRAIN THE PROPOSED LOADING DOCK EAST?

PRE DEVELOPMENT FLOW RATE THAT DRAINS OFF SITE

TOTAL AREA = 34633.32 S.F. = 0.80 ACRES

ROOF AREA = 6690.68 S.F. = 0.15 ACRES (3.5 C.F.S/AC)

GRASS AREA = 0.80 ACRES - 0.15 ACRES = 0.65 ACRES (1.7 C.F.S/AC)

$Q = (0.15\ AC \times 3.5\ C.F.S./AC) + (0.65\ AC \times 1.7\ C.F.S./AC)$
$Q = 0.525\ C.F.S. + 1.105\ C.F.S.$
$Q = 1.63\ C.F.S.$

OFF SITE POST DEVELOPMENT FLOW

TOTAL AREA = 27308.02 S.F. = 0.63 ACRES

ROOF/PAVMT AREA = 11087.32 S.F. = 0.25 ACRES

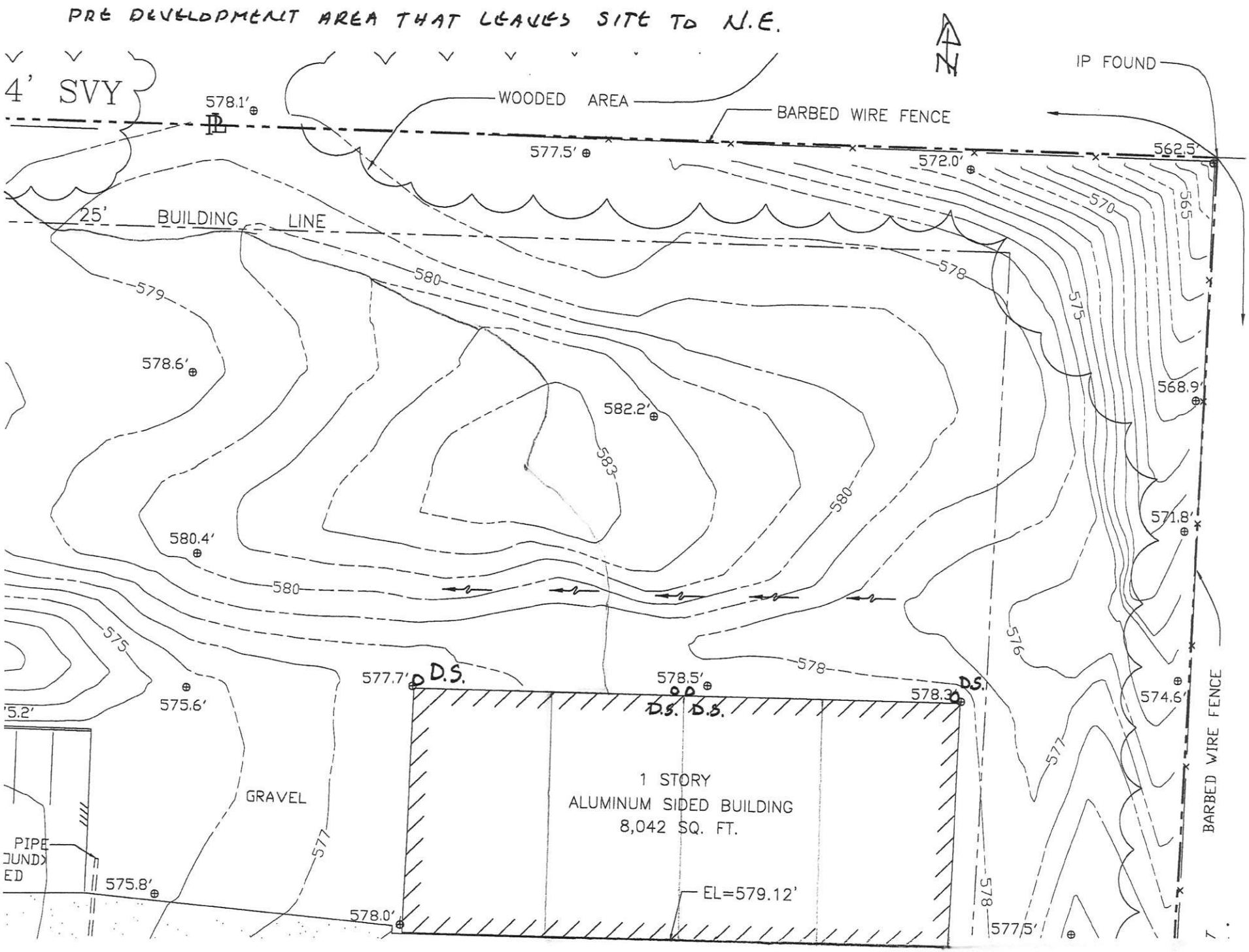
GRASS AREA = 0.63 - 0.25 = 0.38 ACRES

$Q = (0.25\ AC \times 3.5\ C.F.S./AC) + (0.38\ ACRES \times 1.7\ C.F.S./AC)$

$Q = 1.52\ C.F.S.$

CONCLUSION.

SINCE OFF SITE POST DEVELOPMENT FLOW OF 1.52 C.F.S. IS LESS THAN THE OFF SITE PRE DEVELOPMENT FLOW OF 1.63 C.F.S. IT IS ACCEPTABLE TO DRAIN THE LOADING DOCK RUNOFF TO THE EAST.


PRE DEVELOPMENT AREA THAT LEAVES SITE TO N.E.
4' SVY
578.1'
WOODED AREA
BARBED WIRE FENCE
IP FOUND
577.5'
572.0'
562.5'
25' BUILDING LINE
570
565
578
575
579
580
578.6'
582.2'
583
580
568.9'
571.8'
580.4'
580
575
576
578
577.7'
D.S.
578.5'
578.3'
D.S.
D.S. D.S.
574.6'
575.6'
5.2'
GRAVEL
1 STORY
ALUMINUM SIDED BUILDING
8,042 SQ. FT.
577
PIPE
ED
575.8'
EL=579.12'
578.0'
578
577.5'
BARBED WIRE FENCE
N

Z-3

D.A. MAP 1"=20'

SAK Construction - Hoff Road

Existing 7.72 Ac @ 1.15 = 8.88 (2yr)
1.87 = 14.44 (15yr)
2.31 = 17.83 (25yr)
2.95 = 22.77 (100yr)

Proposed	Pervious	Impervious	Total
	2.49 @ 1.15 = 2.86	5.23 @ 2.39 = 12.50	15.36 c.f.s.
	@ 1.87 = 4.66	@ 3.85 = 20.14	24.80 c.f.s.
	@ 2.31 = 5.75	@ 4.75 = 24.84	30.59 c.f.s.
	@ 2.95 = 7.35	@ 6.08 = 31.80	39.15 c.f.s.

	2yr	15yr	25yr	100yr
Existing	8.88	14.44	17.83	22.77
Proposed	15.36	24.80	30.59	39.15
Attenuation	6.48	10.36	12.76	16.38

T.O. to Basin	Pervious	Impervious	Total
	1.01 @ 1.15 = 1.16	3.94 @ 2.39 = 9.42	10.58 c.f.s.
	@ 1.87 = 1.89	@ 3.85 = 15.17	17.06 c.f.s.
	@ 2.31 = 2.33	@ 4.75 = 18.72	21.05 c.f.s.
	@ 2.95 = 2.98	@ 6.08 = 23.96	26.94 c.f.s.

Basin Bypass	Pervious	Impervious	Total
	1.48 @ 1.15 = 1.70	1.29 @ 2.39 = 3.08	4.78 c.f.s.
	@ 1.87 = 2.77	@ 3.85 = 4.97	7.74 c.f.s.
	@ 2.31 = 3.42	@ 4.75 = 6.13	9.55 c.f.s.
	@ 2.98 = 4.41	@ 6.08 = 7.84	12.25 c.f.s.


KIENSTRA
04/20/2011 02:39 PM


04/20/2011 02:39 PM

SAK Construction - Hoff Road

Summary

	2yr	15yr	25yr	100yr
Existing Runoff	8.88	14.44	17.83	22.77
Basin Bypass	4.78	7.74	9.55	12.25
Allowable Release	4.10	6.70	8.28	10.52
T.O. to Basin	10.58	17.06	21.05	26.94
Required Storage	6.48	10.36	12.77	16.42

Pre Developed

2yr	5yr	10yr	25yr	50yr	100yr	1yr
16.12	23.62	28.84	35.01	41.23	46.62	12.15

Post Developed

22.93	30.26	35.13	40.79	46.43	51.16	18.82

Calculated Release

13.95 (565.29) 23.79 (566.36) 26.96 (567.07)

TABLE OF CONTENTS

DETENTION BASIN

The City of O'Fallon detention basin design requirements are that the post development 2, 15, 25, and 100 year storm discharge from the basin be less than the pre development discharge rate for the same return period storms.

Computer programs TR-55 and Hydraflow Hydrographs by Intelesolve were utilized to determine maximum runoff rates and water surface elevations in the detention basin. The NCRS hydrologic characteristic grouping for all soils within the project area is type "C". With a letter designation system from "A" to "D" with "A" being the most pervious and "D" being the least pervious a soil classification of "C" describes a surface that does not readily absorb runoff. This is evident by the minimal increase in flow from the pre to the post development condition.

The following table provides a summary of flow rates and water surface elevations for the detention basin.

7.72 Acres

Storm Return Period, i 3.50	Pre Development Flow, (CFS)	Post Development Flow In, (CFS)	Post Development Flow Out, (CFS)	Elevation
2 Year, ~~2.39~~	5.60	16.55	5.18	564.80
15 Year, 5.20	22.47	38.98	21.18	566.12
25 Year, 5.40	23.74	40.56	22.90	566.18
100 Year, 7.00	34.25	53.13	32.34	566.66

The detention basin was analyzed with the low flow blocked resulting in a maximum water surface elevation of 567.70. The elevation is ~~1.00~~ 1.03 feet lower than the top of the detention basin berm (568.~~70~~ 73) thus providing more than 1 foot of free board.

STORM SEWER DESIGN

The site storm sewers were also designed based on the City of O'Fallon requirement of a 15 year storm recurrence interval. The minimum pipe diameter for the collection system is 12 inch. The storm sewer improvements are limited to adding a grated inlet at the bottom of a ramp for a loading dock and intercepting an existing downspout collector system along the north end of the building, all other areas are either served by an existing storm sewer or surface drains to the detention basin. The runoff value per acre used for the building roof and ramp will be 3.5 c.f.s. per acre (15 year, 100% impervious).

DOWN STREAM STORM SYSTEM ADAQUACY

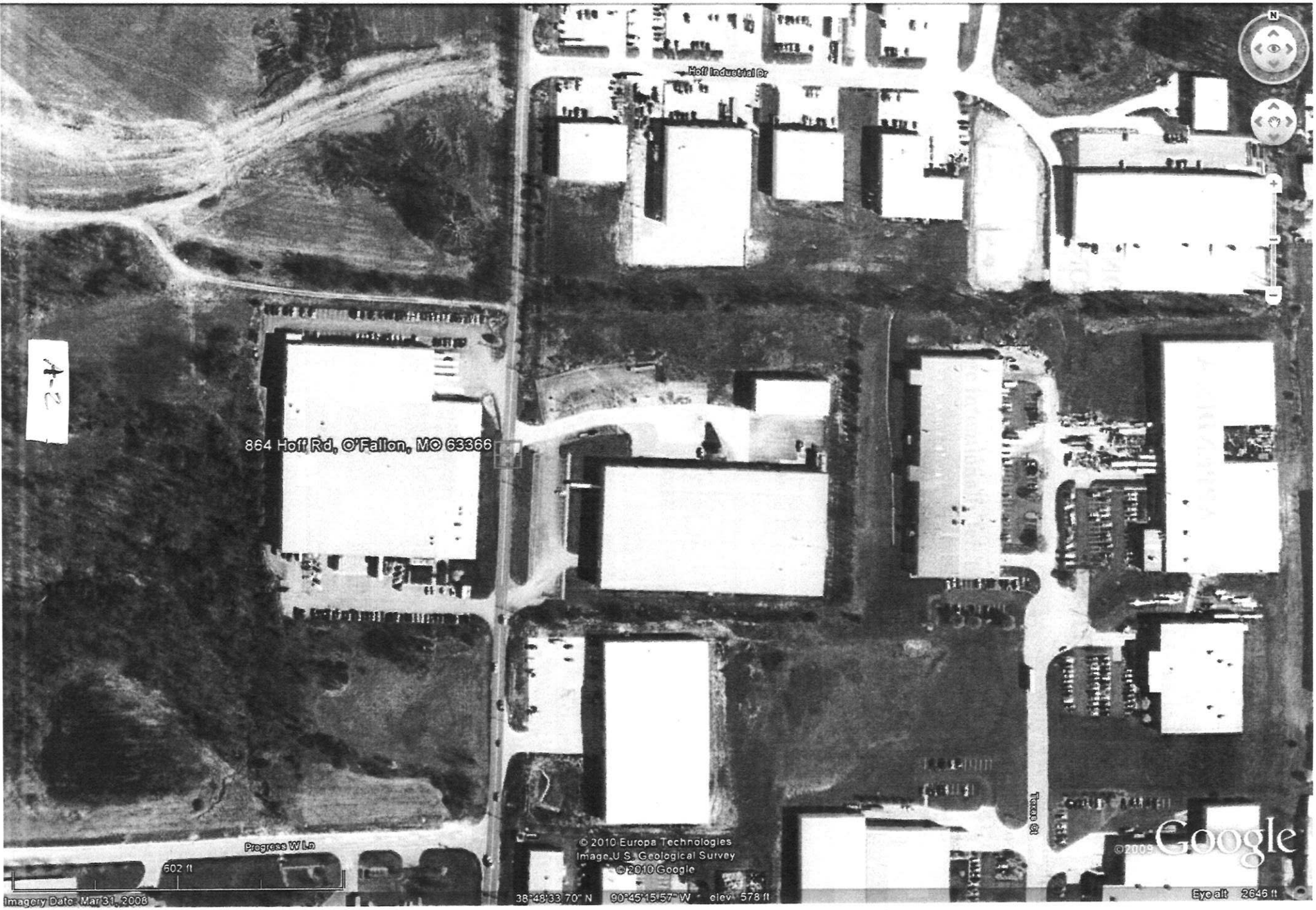
After the Stormwater leaves the existing detention basin it travels in a ditch parallel and east of Hoff Road in a northerly direction. Approximately 80 feet north of the site is a cross road corrugated metal pipe culvert that carries runoff under Hoff Road from the east to the west side. Only the top

few inches of the culvert can be seen, the lower portion is filled with debris. Because of the condition of the culvert it is not possible to determine the adequacy of the storm sewer system downstream of the site. It is however possible to compare the discharge from the site based on the current detention basin with the proposed detention basin and see if the site runoff flow rate has decreased. Reducing the runoff to a level that is less than the rate currently discharged would alleviate any problems that currently exist. The existing basin was modeled and the results can be found in the table below.

Storm Return Period	Pre Development Flow In, (CFS)	Pre Development Flow Out, (CFS)	Elevation	Maximum Storage CF
100 Year	40.90	40.18	566.21	6324

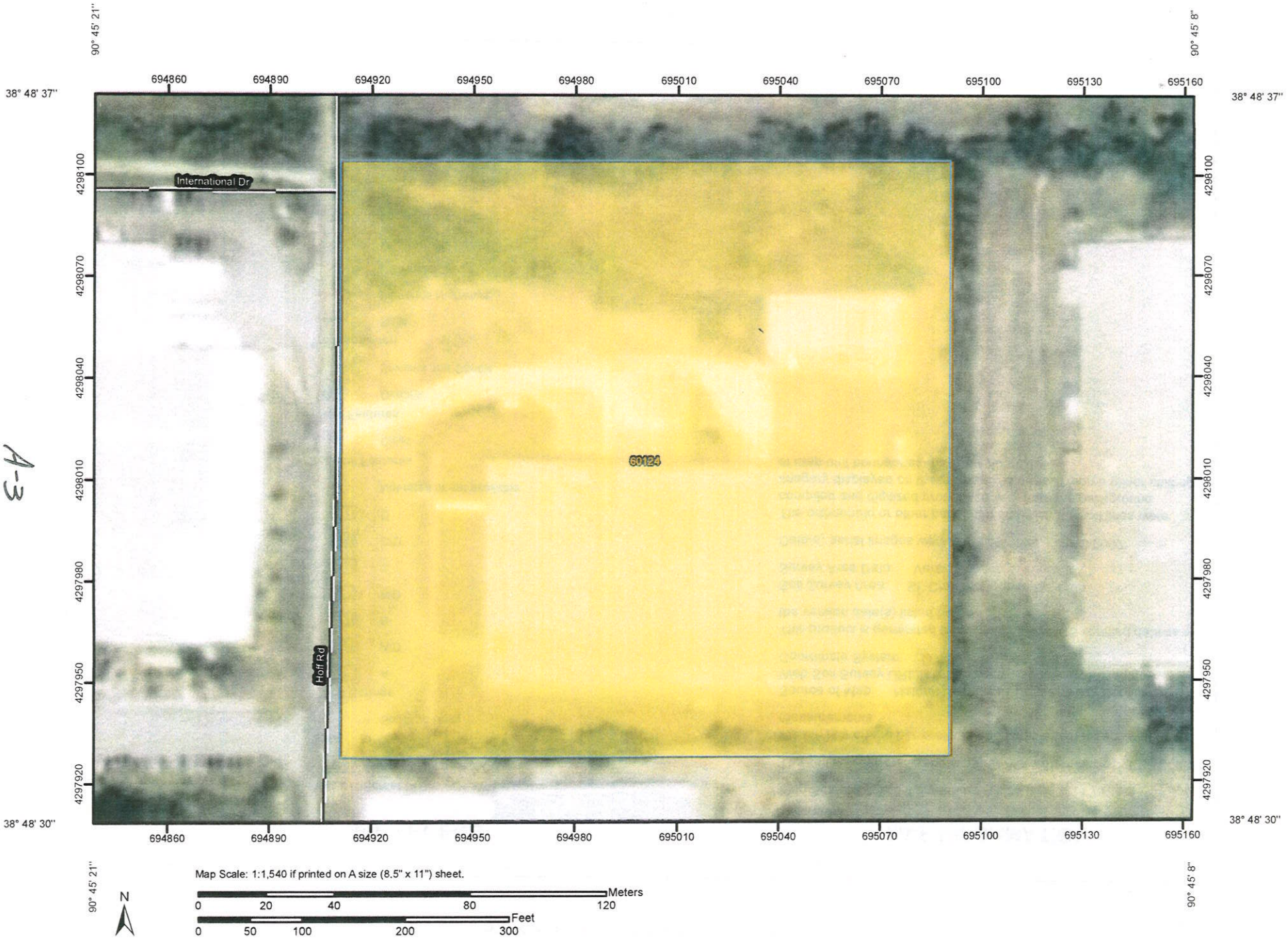
Based on a 100 year storm, the maximum flow rate exiting the basin (site) as it exists today is 40.18 c.f.s., the maximum storage volume is 6324 cubic feet, this compares with 30.48 c.f.s. and a maximum storage volume of 31,336 cubic feet in the post development state. By increasing the detention basin by 5 times we have significantly reduced the discharge from the site.

The site improvements will include cleaning the ditch and cross road culvert to improve flow along and under Hoff Road.



A-2

38.809 N 38° 48' 32.25" W 90° 45' 14.52" 90.754


90° 45' 21"
90° 45' 8"
38° 48' 37"
38° 48' 30"
694860
694890
694920
694950
694980
695010
695040
695070
695100
695130
695160
4298100
4298070
4298040
4298010
4297980
4297950
4297920
International Dr
Hoff Rd
60124
Map Scale: 1:1,540 if printed on A size (8.5" x 11") sheet.
N
Meters
0 20 40 80 120
Feet
0 50 100 200 300

4-3

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features

- Cities

Water Features

- Oceans
- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:1,540 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 15N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: St. Charles County, Missouri
Survey Area Data: Version 9, Jun 3, 2009

Date(s) aerial images were photographed: 8/10/2007

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

4-4

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — St. Charles County, Missouri				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
60124	Harvester-Urban land complex, 2 to 9 percent slopes	C	7.8	100.0%
Totals for Area of Interest			**7.8**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Lower

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COMPUTATION SHEETS

PROJECT #: 2010003-00 | COMPUTED BY: M. DAVIS
PROJECT TITLE: SAK CONSTRUCTION | CHECKED BY:
CLIENT: SAK | DATE: 4-20-2010

TOTAL SITE AREA = 336,398.4 S.F. = 7.73 ACRES
PRE DEV GRASS AREA BYPASSING DETENTION BASIN = 80912 S.F. = 1.86 AC
POST DEV GRASS AREA BYPASSING DETENTION BASIN = 66059 S.F. = 1.52 AC
TOTAL EX SITE AREA DRAINING TO DETENTION BASIN = 7.73 - 1.86 = 5.87 AC

EXISTING AREA OF GRASS DRAINING TO DETENTION BASIN

A = 55400 + 1186 + 6879 + 7677 + 2732
A = 73,874 S.F. = 1.70 ACRES

EXISTING AREA OF BUILDING DRAINING TO DETENTION BASIN:

A = 89086 + 8042 = 97128 S.F.
A = 2.23 ACRES.

EXISTING AREA OF PAVEMENT DRAINING TO DETENTION BASIN

A = 84307. S.F.
A = 1.94 ACRES

FEATURE	AREA	C	CxA
GRASS	1.70	.2	0.34
BLDG	2.23	1.0	2.23
PVMT	1.94	1.0	1.94
	5.87		4.51

5.87 | 4.51 = 0.77 = C

SHEET A-6 OF _____

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COMPUTATION SHEETS

PROJECT #: 2010003-00
PROJECT TITLE: BG4 HOKR ROAD
CLIENT: SAIK CONSTRUCTION

COMPUTED BY: M. DAVIS
CHECKED BY:
DATE: 4-21-2010

ASSUME IN THE PRE DEVELOPMENT CONDITION THAT SITE WAS ROLLING MEADOW / PASTURE.

SOIL IS HYDROLOGIC SOIL GROUP "C"

HIGH POINT IS @ SOUTH EAST CORNER OF SITE ELEV = 586
LOW POINT IS @ NORTH WEST CORNER OF SITE ELEV = 564

ASSUME IN THE PRE DEVELOPMENT CONDITION THE SLOPE WAS CONSTANT

$$S = (586 - 564) \div 808 = 2.72\ \%$$

WinTR-55 Current Data Description

--- Identification Data ---

User: MED
Project: 864 Hoff Road
SubTitle: Pre development state
State: Missouri
County: St. Charles
Filename: L:\2010003-00_SAK_864_Hoff\Calculations & Data\Civil\WIN TR55\pre development.w55

Date: 9/15/2010
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
upstream		site	5.87	79	.224

Total area: 5.87 (ac)

--- Storm Data --

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	15-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
~~2.39~~ 3.50	.0	5.2	5.4	.0	7.0	.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type II
Dimensionless Unit Hydrograph: <standard>

MED

864 Hoff Road
Pre development state
St. Charles County, Missouri

Watershed Peak Table

Sub-Area or Reach Identifier	Peak Flow by Rainfall Return Period 2-Yr (cfs)	15-Yr (cfs)	25-Yr (cfs)	100-Yr (cfs)
SUBAREAS				
upstream	5.60	22.47	23.74	34.25
REACHES				
site	5.60	22.47	23.74	34.25
Down	5.60	22.47	23.74	34.25
OUTLET	5.60	22.47	23.74	34.25

MED

864 Hoff Road
Pre development state
St. Charles County, Missouri

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 2-Yr (cfs) (hr)	15-Yr (cfs) (hr)	25-Yr (cfs) (hr)	100-Yr (cfs) (hr)
SUBAREAS				
upstream	5.60	22.47	23.74	34.25
	12.05	12.03	12.02	12.03
REACHES				
site	5.60	22.47	23.74	34.25
	12.05	12.03	12.02	12.03
Down	5.60	22.47	23.74	34.25
	12.05	12.01	12.02	12.01
OUTLET	5.60	22.47	23.74	34.25

MED

864 Hoff Road
Pre development state
St. Charles County, Missouri

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
upstream							
SHEET	90	0.0272	0.150				0.154
SHALLOW	300	0.0272	0.050				0.031
CHANNEL	418					3.000	0.039
					Time of Concentration		.224

MED

864 Hoff Road
Pre development state
St. Charles County, Missouri

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
upstream	Pasture, grassland or range	(fair)	C	5.87	79
	Total Area / Weighted Curve Number			5.87	79

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COMPUTATION SHEETS

PROJECT #: 2010003-00
PROJECT TITLE: 864 HOFF ROAD
CLIENT: SAK CONSTRUCTION

COMPUTED BY: M. DAVIS
CHECKED BY:
DATE: 7-29-2010

PROPOSED DRAINAGE AREA SURFACES

AREA DRAINING TO BASIN = 6.20 ACRES (1.52 AC GR BYPASS)

BUILDING AREA DRAINING TO BASIN = 89886 + 8042 = 97128 S.F. = 2.23 AC

GRAVEL STORAGE AREA DRAINING TO BASIN = 40,571 S.F. = 0.93 ACRES

GRASS AREA DRAINING TO BASIN = 92927 + 1186 + 6879 + 7677 - 66059
= 42610 S.F.
= 0.98 ACRES

PVMT AREA DRAINING TO BASIN IS :

	TOTAL	BLDG	GRAVEL	GRASS	
PVMT =	6.20	- 2.23	- 0.93	- 0.98	= 2.06 ACRES

DETERMINE COMPOSITE "C" VALUE

	SURFACE	AREA		C	C x A
	GRASS	0.98	x	0.2	0.196
TOTAL 100% IMP IS 5.22 ACRES	BLDG	2.23	x	1.0	2.23
	PVMT	2.06	x	1.0	2.06
	GRAVEL	0.93	x	1.0	0.93
				6.2	5.416

POST DEVELOPMENT C = 0.87

WinTR-55 Current Data Description

--- Identification Data ---

User: MED
Project: 864 Hoff Road
SubTitle: Post development state
State: Missouri
County: St. Charles
Filename: L:\2010003-00_SAK_864_Hoff\Calculations & Data\Civil\WIN TR55\post development.w55

Date: 9/15/2010
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
upstream		site	6.2	95	0.1

Total area: 6.20 (ac)

--- Storm Data --

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	15-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
~~2.39~~ 3.50	.0	5.2 ✓	5.4 ✓	.0	7.0 ✓	.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type II
Dimensionless Unit Hydrograph: <standard>

MED

864 Hoff Road
Post development state
St. Charles County, Missouri

Watershed Peak Table

Sub-Area or Reach Identifier	Peak Flow by Rainfall Return Period 2-Yr (cfs)	15-Yr (cfs)	25-Yr (cfs)	100-Yr (cfs)
SUBAREAS				
upstream	17.01	40.16	41.79	54.74
REACHES				
site	17.01	40.16	41.79	54.74
Down	17.01	40.16	41.79	54.74
OUTLET	17.01	40.16	41.79	54.74

MED

864 Hoff Road
Post development state
St. Charles County, Missouri

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 2-Yr (cfs) (hr)	15-Yr (cfs) (hr)	25-Yr (cfs) (hr)	100-Yr (cfs) (hr)
SUBAREAS				
upstream	17.01	40.16	41.79	54.74
	11.93	11.93	11.93	11.93
REACHES				
site	17.01	40.16	41.79	54.74
	11.93	11.93	11.93	11.93
Down	17.01	40.16	41.79	54.74
	11.93	11.93	11.93	11.93
OUTLET	17.01	40.16	41.79	54.74

MED

864 Hoff Road
Post development state
St. Charles County, Missouri

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
upstream							
SHEET	90	0.0100	0.011				0.028
SHALLOW	130	0.0100	0.025				0.018
CHANNEL	525					5.000	0.029
					Time of Concentration		0.1

MED

864 Hoff Road
Post development state
St. Charles County, Missouri

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use	Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
upstream	Open space; grass cover 50% to 75% (fair)	C	.98	79
	Paved parking lots, roofs, driveways	C	5.22	98
	Total Area / Weighted Curve Number		6.2	95

APPENDIX B

STORM SEWER DESIGN

OK

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COMPUTATION SHEETS

PROJECT #: 2010003-00 | COMPUTED BY: M. DAVIS
PROJECT TITLE: SAK CONSTRUCTION | CHECKED BY:
CLIENT: SAK CONSTRUCTION | DATE: 6-3-2010

SIZE STORM SEWER FROM FES ~~6~~ 5 TO INLET ~~8~~ 7

FLOW IN THIS STORM SEWER ENTERS THE SYSTEM @ INLET 7

D.A. = AREA OF BUILDING + AREA OF RAMP
D.A. = [(~~210~~ 214' x ~~220~~ 399') + 1434] ÷ 43560 = ~~1.0935~~ 1.99 ACRES

Q = ~~1.0935~~ 1.99 ACRES x 3.50 C.F.S. / ACRE
Q = ~~3.83~~ 7.66 C.F.S.

PIPE IS 15" RCP (n = 0.013) @ ~~2.12~~ 1.92 %

$$\frac{AR^{2/3}}{d_o^{8/3}} = \frac{n\,Q}{1.49\,S^{1/2}\,d_o^{8/3}} = \frac{0.013 \times \text{~~3.83~~ } 7.66}{1.49 \times \text{~~.0198~~ } .0192^{1/2} \times 1.25^{8/3}} = \text{~~0.1310~~ } 0.266$$

FROM CHOW OPEN CHANNEL FLOW APPENDIX "A"

@ $\frac{AR^{2/3}}{d_o^{8/3}} = \text{~~0.1310~~ } 0.266$

CAP OF 15" RCP: 8.96 c.f.s.
DISCHARGE V = 6.24 F.P.S.

$\frac{Y}{d_o} = \text{~~.46~~ } .71$ Y = ~~0.575~~ 0.8875

$\frac{A}{d_o^2} = \text{~~.3527~~ } .5964$, A = ~~0.3527~~ 0.5964 x 1.25^2 = ~~0.5511~~ 0.9319 S.F.

V = Q / A = ~~3.83~~ 7.66 C.F.S. / ~~0.5511~~ 0.9319 S.F.
= ~~6.95~~ 8.22 F.P.S.

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OK

COMPUTATION SHEETS

PROJECT #: 2010003-05
PROJECT TITLE: BLUE MOUND ROAD
CLIENT: OAK CONSTRUCTION

COMPUTED BY: M. DAVIS
CHECKED BY:
DATE: AUGUST 19, 2010

SIZE DETENTION BASIN DISCHARGE PIPE

Q_{100} OUTFLOW = 53.13 C.F.S.

$$\frac{A e^{2/3}}{d_o^{8/3}} = \frac{N \times Q}{1.49 \times S^{1/2} \times d_o^{8/3}}$$

$$= \frac{.013 \times 53.13}{1.49 \times (0.0059)^{1/2} \times (3.0)^{8/3}} = 0.3211$$

$$\frac{Y}{d_o} = 0.90 \quad Y = 2.7'$$

$$\frac{A}{d_o^2} = 0.7445 \quad A = 6.70$$

100 yr / 20 min T.Q. = 34.63 c.f.s.
CAP OF 36" RCP = 51.20 C.F.S.
DISCHARGE V = 4.90 F.P.S

$V = Q \div A = 53.13 \div 6.70 = 7.9$ F.P.S. L B Goods.

$1.49 \times 0.13856 \times 1.81$

$1.49 \times 0.1407 \times 1.81$

SHEET B3 OF _____

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Appendix A. Geometric Elements for Circular Channel Sections

d_0 = diameter
y = depth of flow
A = water area
P = wetter perimeter
R = hydraulic radius
T = top width
D = hydraulic depth
$Z = A\sqrt{D}$ = section factor for critical-flow computation

$\frac{y}{d_0}$	$\frac{A}{d_0^2}$	$\frac{P}{d_0}$	$\frac{R}{d_0}$	$\frac{T}{d_0}$	$\frac{D}{d_0}$	$\frac{Z}{d_0^{2.5}}$	$\frac{AR^{2/3}}{d_0^{8/3}}$
0.01	0.0013	0.2003	0.0066	0.1990	0.0066	0.0001	0.0000
0.02	0.0037	0.2838	0.0132	0.2800	0.0134	0.0004	0.0002
0.03	0.0069	0.3482	0.0197	0.3412	0.0202	0.0010	0.0005
0.04	0.0105	0.4027	0.0262	0.3919	0.0268	0.0017	0.0009
0.05	0.0147	0.4510	0.0326	0.4359	0.0336	0.0027	0.0015
0.06	0.0192	0.4949	0.0389	0.4750	0.0406	0.0039	0.0022
0.07	0.0242	0.5355	0.0451	0.5103	0.0474	0.0053	0.0031
0.08	0.0294	0.5735	0.0513	0.5426	0.0542	0.0069	0.0040
0.09	0.0350	0.6094	0.0574	0.5724	0.0612	0.0087	0.0052
0.10	0.0409	0.6435	0.0635	0.6000	0.0682	0.0107	0.0065
0.11	0.0470	0.6761	0.0695	0.6258	0.0752	0.0129	0.0079
0.12	0.0534	0.7075	0.0754	0.6499	0.0822	0.0153	0.0095
0.13	0.0600	0.7377	0.0813	0.6726	0.0892	0.0179	0.0113
0.14	0.0668	0.7670	0.0871	0.6940	0.0964	0.0217	0.0131
0.15	0.0739	0.7954	0.0929	0.7141	0.1034	0.0238	0.0152
0.16	0.0811	0.8230	0.0986	0.7332	0.1106	0.0270	0.0173
0.17	0.0885	0.8500	0.1042	0.7513	0.1178	0.0304	0.0196
0.18	0.0961	0.8763	0.1097	0.7684	0.1252	0.0339	0.0220
0.19	0.1039	0.9020	0.1152	0.7846	0.1324	0.0378	0.0247
0.20	0.1118	0.9273	0.1206	0.8000	0.1398	0.0418	0.0273
0.21	0.1199	0.9521	0.1259	0.8146	0.1472	0.0460	0.0301
0.22	0.1281	0.9764	0.1312	0.8285	0.1546	0.0503	0.0333
0.23	0.1365	1.0003	0.1364	0.8417	0.1622	0.0549	0.0359
0.24	0.1449	1.0239	0.1416	0.8542	0.1696	0.0597	0.0394
0.25	0.1535	1.0472	0.1466	0.8660	0.1774	0.0646	0.0427
0.26	0.1623	1.0701	0.1516	0.8773	0.1850	0.0697	0.0464
0.27	0.1711	1.0928	0.1566	0.8879	0.1926	0.0751	0.0497
0.28	0.1800	1.1152	0.1614	0.8980	0.2004	0.0805	0.0536
0.29	0.1890	1.1373	0.1662	0.9075	0.2084	0.0862	0.0571
0.30	0.1982	1.1593	0.1709	0.9165	0.2162	0.0921	0.0610

Appendix A. Geometric Elements for Circular Channel Sections (*continued*)

$\frac{y}{d_0}$	$\frac{A}{d_0^2}$	$\frac{P}{d_0}$	$\frac{R}{d_0}$	$\frac{T}{d_0}$	$\frac{D}{d_0}$	$\frac{Z}{d_0^{2.5}}$	$\frac{AR^{2/3}}{d_0^{8/3}}$
0.31	0.2074	1.1810	0.1755	0.9250	0.2242	0.0981	0.0650
0.32	0.2167	1.2025	0.1801	0.9330	0.2322	0.1044	0.0690
0.33	0.2260	1.2239	0.1848	0.9404	0.2404	0.1107	0.0736
0.34	0.2355	1.2451	0.1891	0.9474	0.2486	0.1172	0.0776
0.35	0.2450	1.2661	0.1935	0.9539	0.2568	0.1241	0.0820
0.36	0.2546	1.2870	0.1978	0.9600	0.2652	0.1310	0.0864
0.37	0.2642	1.3078	0.2020	0.9656	0.2736	0.1381	0.0909
0.38	0.2739	1.3284	0.2061	0.9708	0.2822	0.1453	0.0955
0.39	0.2836	1.3490	0.2102	0.9755	0.2908	0.1528	0.1020
0.40	0.2934	1.3694	0.2142	0.9798	0.2994	0.1603	0.1050
0.41	0.3032	1.3898	0.2181	0.9837	0.3082	0.1682	0.1100
0.42	0.3132	1.4101	0.2220	0.9871	0.3172	0.1761	0.1147
0.43	0.3229	1.4303	0.2257	0.9902	0.3262	0.1844	0.1196
0.44	0.3328	1.4505	0.2294	0.9928	0.3352	0.1927	0.1245
0.45	0.3428	1.4706	0.2331	0.9950	0.3446	0.2011	0.1298
0.46	0.3527	1.4907	0.2366	0.9968	0.3538	0.2098	0.1348
0.47	0.3627	1.5108	0.2400	0.9982	0.3634	0.2186	0.1401
0.48	0.3727	1.5308	0.2434	0.9992	0.3730	0.2275	0.1452
0.49	0.3827	1.5508	0.2467	0.9998	0.3828	0.2366	0.1505
0.50	0.3927	1.5708	0.2500	1.0000	0.3928	0.2459	0.1558
0.51	0.4027	1.5908	0.2531	0.9998	0.4028	0.2553	0.1610
0.52	0.4127	1.6108	0.2561	0.9992	0.4130	0.2650	0.1664
0.53	0.4227	1.6308	0.2591	0.9982	0.4234	0.2748	0.1715
0.54	0.4327	1.6509	0.2620	0.9968	0.4340	0.2848	0.1772
0.55	0.4426	1.6710	0.2649	0.9950	0.4448	0.2949	0.1825
0.56	0.4526	1.6911	0.2676	0.9928	0.4558	0.3051	0.1878
0.57	0.4625	1.7113	0.2703	0.9902	0.4670	0.3158	0.1933
0.58	0.4723	1.7315	0.2728	0.9871	0.4786	0.3263	0.1987
0.59	0.4822	1.7518	0.2753	0.9837	0.4902	0.3373	0.2041
0.60	0.4920	1.7722	0.2776	0.9798	0.5022	0.3484	0.2092
0.61	0.5018	1.7926	0.2797	0.9755	0.5144	0.3560	0.2146
0.62	0.5115	1.8132	0.2818	0.9708	0.5270	0.3710	0.2199
0.63	0.5212	1.8338	0.2839	0.9656	0.5398	0.3830	0.2252
0.64	0.5308	1.8546	0.2860	0.9600	0.5530	0.3945	0.2302
0.65	0.5404	1.8755	0.2881	0.9539	0.5666	0.4066	0.2358

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Appendix A. Geometric Elements for Circular Channel Sections (*continued*)

$\frac{y}{d_0}$	$\frac{A}{d_0^2}$	$\frac{P}{d_0}$	$\frac{R}{d_0}$	$\frac{T}{d_0}$	$\frac{D}{d_0}$	$\frac{Z}{d_0^{2.5}}$	$\frac{AR^{2/3}}{d_0^{8/3}}$
0.66	0.5499	1.8965	0.2899	0.9474	0.5804	0.4188	0.2407
0.67	0.5594	1.9177	0.2917	0.9404	0.5948	0.4309	0.2460
0.68	0.5687	1.9391	0.2935	0.9330	0.6096	0.4437	0.2510
0.69	0.5780	1.9606	0.2950	0.9250	0.6250	0.4566	0.2560
0.70	0.5872	1.9823	0.2962	0.9165	0.6408	0.4694	0.2608
0.71	0.5964	2.0042	0.2973	0.9075	0.6572	0.4831	0.2653
0.72	0.6054	2.0264	0.2984	0.8980	0.6742	0.4964	0.2702
0.73	0.6143	2.0488	0.2995	0.8879	0.6918	0.5100	0.2751
0.74	0.6231	2.0714	0.3006	0.8773	0.7104	0.5248	0.2794
0.75	0.6318	2.0944	0.3017	0.8660	0.7296	0.5392	0.2840
0.76	0.6404	2.1176	0.3025	0.8542	0.7498	0.5540	0.2888
0.77	0.6489	2.1412	0.3032	0.8417	0.7710	0.5695	0.2930
0.78	0.6573	2.1652	0.3037	0.8285	0.7934	0.5850	0.2969
0.79	0.6655	2.1895	0.3040	0.8146	0.8170	0.6011	0.3008
0.80	0.6736	2.2143	0.3042	0.8000	0.8420	0.6177	0.3045
0.81	0.6815	2.2395	0.3044	0.7846	0.8686	0.6347	0.3082
0.82	0.6893	2.2653	0.3043	0.7684	0.8970	0.6524	0.3118
0.83	0.6969	2.2916	0.3041	0.7513	0.9276	0.6707	0.3151
0.84	0.7043	2.3186	0.3038	0.7332	0.9606	0.6897	0.3182
0.85	0.7115	2.3462	0.3033	0.7141	0.9964	0.7098	0.3212
0.86	0.7186	2.3746	0.3026	0.6940	1.0354	0.7307	0.3240
0.87	0.7254	2.4038	0.3017	0.6726	1.0784	0.7528	0.3264
0.88	0.7320	2.4341	0.3008	0.6499	1.1264	0.7754	0.3286
0.89	0.7380	2.4655	0.2996	0.6258	1.1800	0.8016	0.3307
0.90	0.7445	2.4981	0.2980	0.6000	1.2408	0.8285	0.3324
0.91	0.7504	2.5322	0.2963	0.5724	1.3110	0.8586	0.3336
0.92	0.7560	2.5681	0.2944	0.5426	1.3932	0.8917	0.3345
0.93	0.7612	2.6061	0.2922	0.5103	1.4918	0.9292	0.3350
0.94	0.7662	2.6467	0.2896	0.4750	1.6130	0.9725	0.3353
0.95	0.7707	2.6906	0.2864	0.4359	1.7682	1.0242	0.3349
0.96	0.7749	2.7389	0.2830	0.3919	1.9770	1.0888	0.3340
0.97	0.7785	2.7934	0.2787	0.3412	2.2820	1.1752	0.3322
0.98	0.7816	2.8578	0.2735	0.2800	2.7916	1.3050	0.3291
0.99	0.7841	2.9412	0.2665	0.1990	3.9400	1.5554	0.3248
1.00	0.7854	3.1416	0.2500	0.0000	∞	∞	0.3117

OK

DAVID MASON & ASSOCIATES
CHICAGO, IL • ST. LOUIS, MO • DALLAS, TX

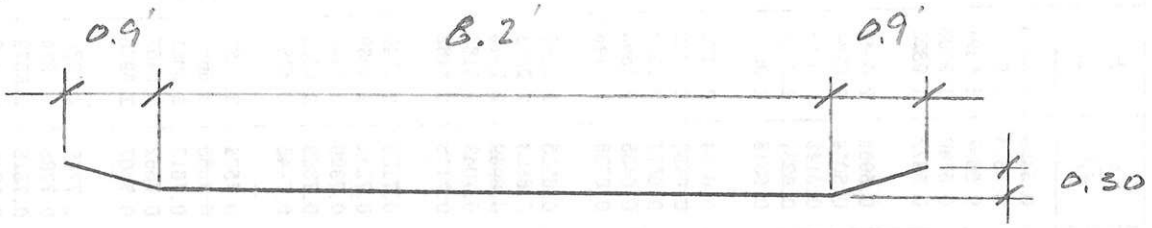
COMPUTATION SHEETS

PROJECT #: 2010003-00
PROJECT TITLE: 864 Hoff Road
CLIENT: SAR Construction

COMPUTED BY: M. Davis
CHECKED BY:
DATE: 6-17-2010

VEGETATED SWALE

Q= 3.83 C.F.S. (15" PIPE FROM BUILDING)
S = 1.0%, N= 0.024



DESCRIPTION	VALUE
Channel Bottom Slope (ft/ft)	0.01
Manning's Roughness Coefficient (n-value)	0.024
Channel Left Side Slope (horizontal/vertical)	3.0
Channel Right Side Slope (horizontal/vertical)	3.0
Channel Bottom Width (ft)	8.2
Minimum Flow Depth (ft)	0.1
Maximum Flow Depth (ft)	0.3
Incremental Head (ft)	0.01

COMPUTATION RESULTS

Flow Depth (ft)	Flow Rate (cfs)	Flow Velocity (fps)	Froude Number	Velocity Head (ft)	Energy Head (ft)	Flow Area (sq ft)	Top Width (ft)
0.1	1.11	1.3	0.738	0.026	0.126	0.85	8.8
0.11	1.3	1.38	0.749	0.03	0.14	0.94	8.86
0.12	1.5	1.46	0.759	0.033	0.153	1.03	8.92
0.13	1.72	1.54	0.769	0.037	0.167	1.12	8.98
0.14	1.95	1.61	0.778	0.04	0.18	1.21	9.04
0.15	2.18	1.68	0.786	0.044	0.194	1.3	9.1
0.16	2.44	1.75	0.794	0.048	0.208	1.39	9.16
0.17	2.7	1.82	0.802	0.052	0.222	1.48	9.22
0.18	2.97	1.89	0.809	0.055	0.235	1.57	9.28
0.19	3.26	1.95	0.815	0.059	0.249	1.67	9.34
0.2	3.55	2.02	0.822	0.063	0.263	1.76	9.4
0.21	3.86	2.08	0.828	0.067	0.277	1.85	9.46
0.22	4.17	2.14	0.834	0.071	0.291	1.95	9.52
0.23	4.5	2.2	0.839	0.075	0.305	2.04	9.58
0.24	4.83	2.26	0.845	0.079	0.319	2.14	9.64
0.25	5.18	2.32	0.85	0.083	0.333	2.24	9.7
0.26	5.54	2.37	0.855	0.087	0.347	2.33	9.76
0.27	5.91	2.43	0.86	0.092	0.362	2.43	9.82
0.28	6.28	2.48	0.865	0.096	0.376	2.53	9.88
0.29	6.67	2.54	0.869	0.1	0.39	2.63	9.94
0.3	7.07	2.59	0.873	0.104	0.404	2.73	10.0

APPENDIX C

WATER QUALITY VOLUME AND DESIGN

OK

DAVID MASON & ASSOCIATES
CHICAGO, IL • ST. LOUIS, MO • DALLAS, TX

COMPUTATION SHEETS

PROJECT #: 2010002-00
PROJECT TITLE: 864 HOOK ROAD
CLIENT: OAK CONSTRUCTION

COMPUTED BY: M. DAVIS
CHECKED BY:
DATE: 7-28-2010

DETERMINE SEMI-MEAN STORAGE VOLUME

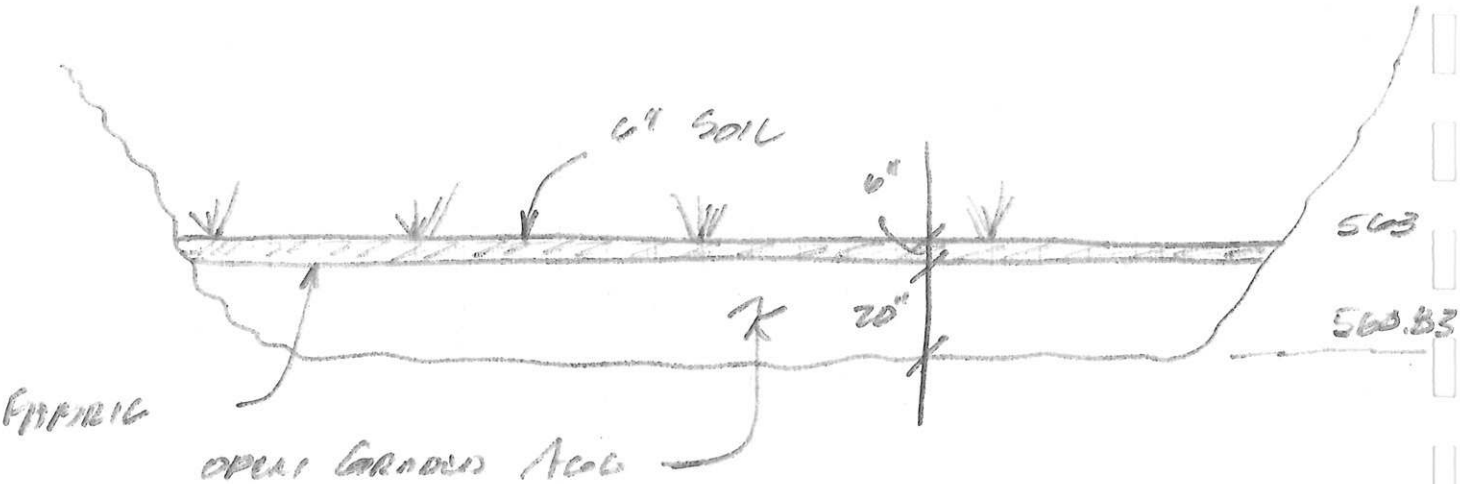
VOLUME = 0.2 IN X SITE AREA
= 0.2 IN x 1/12 X 7.72 AC X 43560
= 5610 CUBIC FEET

- USE BASE OF RETENTION BASIN TO STORE THIS VOLUME.
- ASSUMING 40% VOID SPACE DETERMINE DEPTH OF STORAGE ROCK

$\frac{5610}{.40}$ C.F. = AREA OF BASIN X DEPTH OF ROCK.

14,025 C.F. = 8641 (AREA @ 563 CONTOUR) X DEPTH OF ROCK

DEPTH OF ROCK = 1.62' = 1' 7.5" = 1' 8" = 20"



APPENDIX D

DETENTION BASIN RESERVOIR REPORT

Reservoir Report

English

Reservoir No. 1 - FL 562.89

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

Stage ft	Elevation ft	Contour area sqft	Incr. Storage cuft	Total storage cuft
0.00	562.89	00	0	0
0.11	563.00	530	29	29
1.11	564.00	9,767	5,149	5,178
2.11	565.00	10,947	10,357	15,535
3.11	566.00	12,190	11,569	27,103
4.11	567.00	13,485	12,838	39,941
5.11	568.00	14,832	14,159	54,099

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 13.0	14.0	0.0	0.0
Span in	= 13.0	23.0	0.0	0.0
No. Barrels	= 1	2	0	0
Invert El. ft	= 562.89	564.80	0.00	0.00
Length ft	= 10.0	10.0	0.0	0.0
Slope %	= 1.00	1.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 15.00	0.00	0.00	0.00
Crest El. ft	= 566.67	0.00	0.00	0.00
Weir Coeff.	= 3.00	0.00	0.00	0.00
Eqn. Exp.	= 1.50	0.00	0.00	0.00
Multi-Stage	= No	No	No	No

Tailwater Elevation = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Discharge cfs
0.00	0	562.89	0.00	0.00	---	---	0.00	---	---	---	0.00
0.11	29	563.00	0.06	0.00	---	---	0.00	---	---	---	0.06
1.11	5,178	564.00	1.97	0.00	---	---	0.00	---	---	---	1.97
2.11	15,535	565.00	5.56	1.17	---	---	0.00	---	---	---	6.72
3.11	27,103	566.00	7.11	10.08	---	---	0.00	---	---	---	17.20
4.11	39,941	567.00	8.38	27.38	---	---	8.53	---	---	---	44.29
5.11	54,099	568.00	9.48	34.83	---	---	69.02	---	---	---	113.34

APPENDIX I

DETENTION BASIN 100 YR, 24 HOUR STORM

LOW FLOW BLOCKED

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Return period (yrs)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	53.13	3	717	135,157	100	----	------	------	864 Hoff Road
2	Reservoir	46.79	3	720	100,352	100	1	567.70	49,800	Thru Basin

Hydrograph Report

English

Hyd. No. 1

864 Hoff Road

Hydrograph type	= SCS Runoff	Peak discharge	= 53.13 cfs
Storm frequency	= 100 yrs	Time interval	= 3 min
Drainage area	= 6.20 ac	Curve number	= 95
Basin Slope	= 2.7 %	Hydraulic length	= 808 ft
Tc method	= USER	Time of conc. (Tc)	= 6 min
Total precip.	= 7.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Total Volume = 135,157 cuft

Hydrograph Discharge Table

Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)
369	0.53	849	1.49
384	0.56	864	1.42
399	0.59	879	1.35
414	0.62	894	1.28
429	0.64	909	1.21
444	0.67	924	1.13
459	0.70	939	1.06
474	0.72	954	0.99
489	0.77	969	0.93
504	0.86	984	0.91
519	0.96	999	0.88
534	1.06	1014	0.86
549	1.14	1029	0.83
564	1.16	1044	0.80
579	1.20	1059	0.78
594	1.36	1074	0.75
609	1.54	1089	0.73
624	1.78	1104	0.70
639	2.05	1119	0.68
654	2.45	1134	0.65
669	2.78	1149	0.63
684	3.94	1164	0.60
699	10.64	1179	0.58
714	44.55	1194	0.55
729	9.62		
744	5.31		
759	3.44	*...End*	
774	2.89		
789	2.42		
804	2.13		
819	1.87		
834	1.66		

Hydrograph Report

English

Hyd. No. 2

Thru Basin

Hydrograph type	= Reservoir	Peak discharge	= 46.79 cfs
Storm frequency	= 100 yrs	Time interval	= 3 min
Inflow hyd. No.	= 1	Reservoir name	= FL 562.89
Max. Elevation	= 567.70 ft	Max. Storage	= 49,800 cuft

Storage Indication method used.

Total Volume = 100,352 cuft

Hydrograph Discharge Table

Time (min)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
705	19.58	566.85	0.00	0.00	-----	-----	3.42	-----	-----	-----	3.42
720	49.17	567.70 <<	0.00	0.00	-----	-----	46.79	-----	-----	-----	46.79 <<
735	6.70	567.08	0.00	0.00	-----	-----	11.84	-----	-----	-----	11.84
750	4.39	566.92	0.00	0.00	-----	-----	5.61	-----	-----	-----	5.61
765	3.20	566.86	0.00	0.00	-----	-----	3.73	-----	-----	-----	3.73
780	2.68	566.83	0.00	0.00	-----	-----	2.97	-----	-----	-----	2.97
795	2.30	566.81	0.00	0.00	-----	-----	2.49	-----	-----	-----	2.49
810	2.02	566.80	0.00	0.00	-----	-----	2.17	-----	-----	-----	2.17
825	1.78	566.79	0.00	0.00	-----	-----	1.94	-----	-----	-----	1.94
840	1.58	566.78	0.00	0.00	-----	-----	1.74	-----	-----	-----	1.74
855	1.46	566.77	0.00	0.00	-----	-----	1.56	-----	-----	-----	1.56
870	1.39	566.77	0.00	0.00	-----	-----	1.46	-----	-----	-----	1.46
885	1.32	566.76	0.00	0.00	-----	-----	1.38	-----	-----	-----	1.38
900	1.25	566.76	0.00	0.00	-----	-----	1.30	-----	-----	-----	1.30
915	1.18	566.75	0.00	0.00	-----	-----	1.23	-----	-----	-----	1.23
930	1.11	566.75	0.00	0.00	-----	-----	1.16	-----	-----	-----	1.16
945	1.03	566.75	0.00	0.00	-----	-----	1.09	-----	-----	-----	1.09
960	0.96	566.74	0.00	0.00	-----	-----	1.02	-----	-----	-----	1.02
975	0.92	566.74	0.00	0.00	-----	-----	0.96	-----	-----	-----	0.96
990	0.90	566.74	0.00	0.00	-----	-----	0.92	-----	-----	-----	0.92
1005	0.87	566.73	0.00	0.00	-----	-----	0.89	-----	-----	-----	0.89
1020	0.85	566.73	0.00	0.00	-----	-----	0.86	-----	-----	-----	0.86
1035	0.82	566.73	0.00	0.00	-----	-----	0.84	-----	-----	-----	0.84
1050	0.79	566.73	0.00	0.00	-----	-----	0.81	-----	-----	-----	0.81
1065	0.77	566.73	0.00	0.00	-----	-----	0.79	-----	-----	-----	0.79
1080	0.74	566.73	0.00	0.00	-----	-----	0.76	-----	-----	-----	0.76
1095	0.72	566.73	0.00	0.00	-----	-----	0.74	-----	-----	-----	0.74
1110	0.69	566.73	0.00	0.00	-----	-----	0.71	-----	-----	-----	0.71
1125	0.67	566.72	0.00	0.00	-----	-----	0.69	-----	-----	-----	0.69
1140	0.64	566.72	0.00	0.00	-----	-----	0.66	-----	-----	-----	0.66
1155	0.62	566.72	0.00	0.00	-----	-----	0.64	-----	-----	-----	0.64
1170	0.59	566.72	0.00	0.00	-----	-----	0.61	-----	-----	-----	0.61
1185	0.57	566.72	0.00	0.00	-----	-----	0.58	-----	-----	-----	0.58
1200	0.54	566.72	0.00	0.00	-----	-----	0.56	-----	-----	-----	0.56
1215	0.53	566.72	0.00	0.00	-----	-----	0.54	-----	-----	-----	0.54
1230	0.52	566.72	0.00	0.00	-----	-----	0.53	-----	-----	-----	0.53

Continues on next page...

APPENDIX J

EXISTING DETENTION BASIN 100 YR, 24 HOUR STORM

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Return period (yrs)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	40.90	3	723	137,834	100	----	------	------	864 Hoff Road
2	Reservoir	40.18	3	726	137,834	100	1	566.21	6,324	Thru Basin

Hydrograph Report

English

Hyd. No. 1

864 Hoff Road

Hydrograph type	= SCS Runoff	Peak discharge	= 40.90 cfs
Storm frequency	= 100 yrs	Time interval	= 3 min
Drainage area	= 6.20 ac	Curve number	= 91
Basin Slope	= 2.7 %	Hydraulic length	= 808 ft
Tc method	= USER	Time of conc. (Tc)	= 16.5 min
Total precip.	= 7.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Total Volume = 137,834 cuft

Hydrograph Discharge Table

Time (min)	Outflow (cfs)
693	4.14
696	4.79
699	5.97
702	7.89
705	10.56
708	14.14
711	18.95
714	25.30
717	32.45
720	38.25
723	40.90 <<
726	39.41
729	34.46
732	28.47
735	22.74
738	17.41
741	12.74
744	9.13
747	6.97
750	6.06
753	5.57
756	5.11
759	4.69
762	4.33

...End

Hydrograph Report

English

Hyd. No. 2

Thru Basin

Hydrograph type	= Reservoir	Peak discharge	= 40.18 cfs
Storm frequency	= 100 yrs	Time interval	= 3 min
Inflow hyd. No.	= 1	Reservoir name	= Existing Pond
Max. Elevation	= 566.21 ft	Max. Storage	= 6,324 cuft

Storage Indication method used.

Total Volume = 137,834 cuft

Hydrograph Discharge Table

Time (min)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
696	4.79	565.59	2.47	-----	-----	-----	1.75	-----	-----	-----	4.22
699	5.97	565.62	2.57	-----	-----	-----	2.59	-----	-----	-----	5.16
702	7.89	565.66	2.72	-----	-----	-----	3.99	-----	-----	-----	6.70
705	10.56	565.72	2.92	-----	-----	-----	6.08	-----	-----	-----	8.99
708	14.14	565.78	3.16	-----	-----	-----	9.15	-----	-----	-----	12.31
711	18.95	565.87	3.43	-----	-----	-----	13.33	-----	-----	-----	16.76
714	25.30	565.96	3.72	-----	-----	-----	18.95	-----	-----	-----	22.67
717	32.45	566.06	4.02	-----	-----	-----	25.00	-----	-----	-----	29.02
720	38.25	566.14	4.28	-----	-----	-----	31.01	-----	-----	-----	35.29
723	40.90 <<	566.20	4.43	-----	-----	-----	35.18	-----	-----	-----	39.61
726	39.41	566.21 <<	4.44	-----	-----	-----	35.74	-----	-----	-----	40.18 <<
729	34.46	566.16	4.33	-----	-----	-----	32.56	-----	-----	-----	36.89
732	28.47	566.09	4.14	-----	-----	-----	27.31	-----	-----	-----	31.45
735	22.74	566.01	3.87	-----	-----	-----	21.90	-----	-----	-----	25.77
738	17.41	565.91	3.58	-----	-----	-----	15.91	-----	-----	-----	19.49
741	12.74	565.83	3.31	-----	-----	-----	11.44	-----	-----	-----	14.75
744	9.13	565.75	3.05	-----	-----	-----	7.81	-----	-----	-----	10.86
747	6.97	565.70	2.85	-----	-----	-----	5.25	-----	-----	-----	8.10
750	6.06	565.66	2.72	-----	-----	-----	4.00	-----	-----	-----	6.72
753	5.57	565.64	2.65	-----	-----	-----	3.28	-----	-----	-----	5.93
756	5.11	565.63	2.60	-----	-----	-----	2.82	-----	-----	-----	5.41
759	4.69	565.61	2.55	-----	-----	-----	2.41	-----	-----	-----	4.96
762	4.33	565.60	2.52	-----	-----	-----	2.05	-----	-----	-----	4.57
765	4.04	565.59	2.48	-----	-----	-----	1.80	-----	-----	-----	4.28
768	3.80	565.58	2.44	-----	-----	-----	1.61	-----	-----	-----	4.05

...End

Reservoir Report

English

Reservoir No. 1 - Existing Pond

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

Stage ft	Elevation ft	Contour area sqft	Incr. Storage cuft	Total storage cuft
0.00	564.70	00	0	0
0.30	565.00	3,187	478	478
1.30	566.00	5,738	4,462	4,941
2.30	567.00	7,583	6,661	11,601
3.30	568.00	7,583	7,583	19,184

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 21.0	0.0	0.0	0.0
Span in	= 21.0	0.0	0.0	0.0
No. Barrels	= 1	0	0	0
Invert El. ft	= 564.70	0.00	0.00	0.00
Length ft	= 10.0	0.0	0.0	0.0
Slope %	= 1.00	0.00	0.00	0.00
N-Value	= .013	.000	.000	.000
Orif. Coeff.	= 0.60	0.00	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

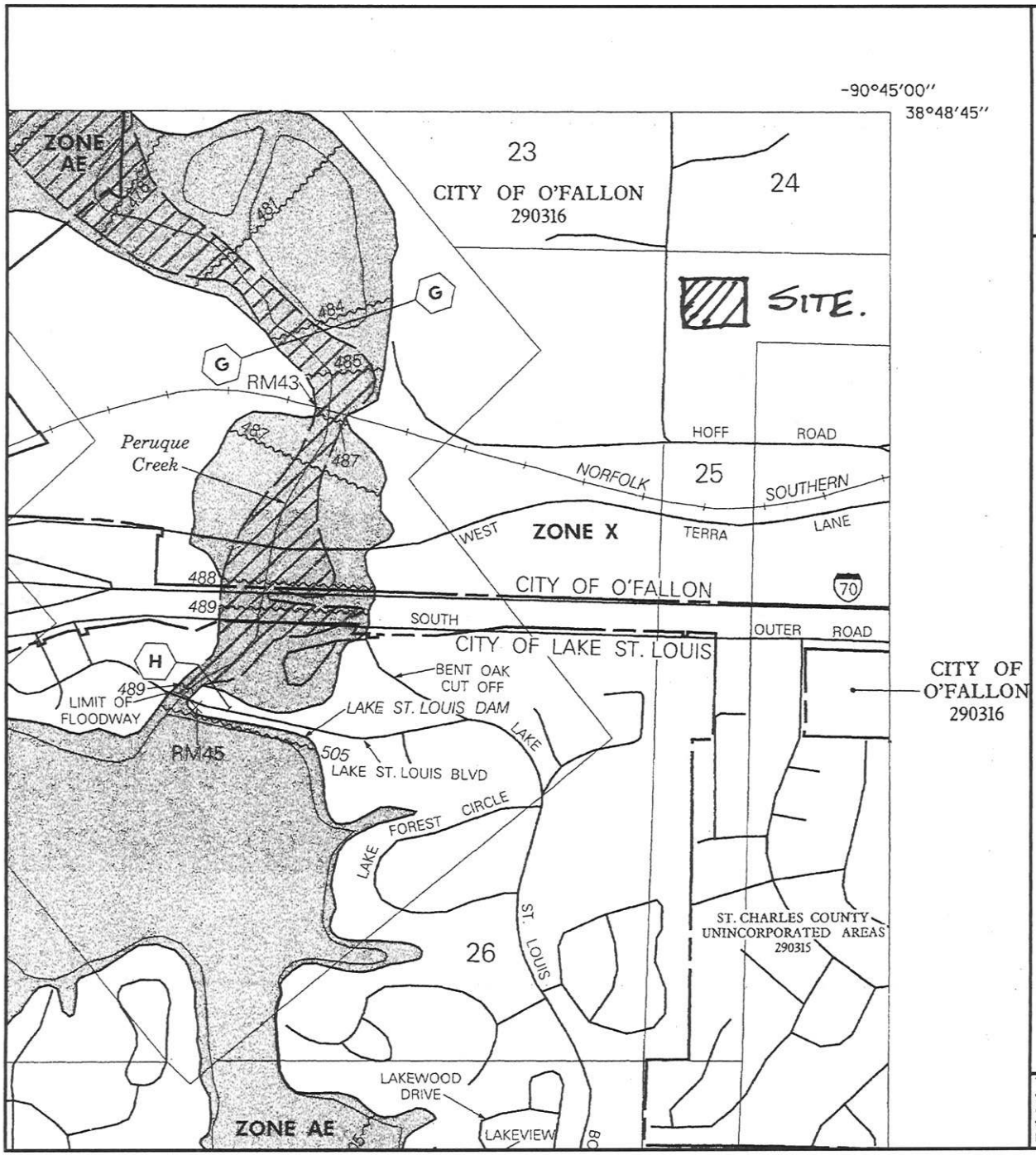
	[A]	[B]	[C]	[D]
Crest Len ft	= 20.00	0.00	0.00	0.00
Crest El. ft	= 565.50	0.00	0.00	0.00
Weir Coeff.	= 3.00	0.00	0.00	0.00
Eqn. Exp.	= 1.50	0.00	0.00	0.00
Multi-Stage	= No	No	No	No

Tailwater Elevation = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Discharge cfs
0.00	0	564.70	0.00	---	---	---	0.00	---	---	---	0.00
0.30	478	565.00	0.51	---	---	---	0.00	---	---	---	0.51
1.30	4,941	566.00	3.83	---	---	---	21.21	---	---	---	25.05
2.30	11,601	567.00	12.12	---	---	---	110.23	---	---	---	122.35
3.30	19,184	568.00	18.03	---	---	---	237.17	---	---	---	255.20



K-2

APPROXIMATE SCALE IN FEET

1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

ST. CHARLES COUNTY, MISSOURI AND INCORPORATED AREAS

PANEL 220 OF 525

(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
DARDENNE PRAIRIE, TOWN OF	290899	0220	F
LAKE ST. LOUIS, CITY OF	290968	0220	F
O'FALLON, CITY OF	290316	0220	F
ST. CHARLES COUNTY, UNINCORPORATED AREAS	290315	0220	F
WENTZVILLE, CITY OF	290320	0220	F

MAP NUMBER
29183C0220 F

MAP REVISED:
MARCH 17, 2003

Federal Emergency Management Agency

MISSOURI DEPARTMENT OF NATURAL RESOURCES
WATER PROTECTION PROGRAM
FORM E – APPLICATION FOR GENERAL PERMIT
UNDER MISSOURI CLEAN WATER LAW

FOR AGENCY USE ONLY	
CHECK NUMBER	
DATE RECEIVED	FEE SUBMITTED

1.00 CATEGORY OF GENERAL PERMIT APPLIED FOR
LAND DISTURBANCE

1.10
☐ a. This facility is now in operation under Missouri Operating Permit Number, or NPDES, MO – _____ and there is not a proposed increase in design flow.
☐ b. This facility is now in operation under Missouri Operating Permit Number MO – _____ and there is a proposed increase in design flow.
☒ c. This is a new permit.

If you checked either item **b** or **c** above then you may need to submit an antidegradation review. See instructions.

2.00 NAME OF FACILITY
SAK CONSTRUCTION

2.10 ADDRESS (PHYSICAL)	CITY	STATE	ZIP CODE
864 HOFF ROAD	O'FALLON	MO	63366

3.00 OWNER

NAME	E-MAIL ADDRESS	TELEPHONE NUMBER WITH AREA CODE	
JERRY SHAW	JSHAW@SAKCONST.COM		636-379-2350
		FAX NUMBER WITH AREA CODE	636-379-2461
STREET	CITY	STATE	ZIP CODE
103 N COOL SPRINGS RD	O'FALLON	MO	63366

4.00 CONTINUING AUTHORITY

NAME	E-MAIL ADDRESS	TELEPHONE NUMBER WITH AREA CODE	
SAME AS OWNER			
		FAX NUMBER WITH AREA CODE	
STREET	CITY	STATE	ZIP CODE

5.00 OPERATOR

NAME	TELEPHONE NUMBER WITH AREA CODE
SAME AS OWNER	

6.00 FACILITY CONTACT

NAME	TELEPHONE NUMBER WITH AREA CODE
SAME AS OWNER	
	FAX NUMBER WITH AREA CODE

TITLE

7.00 FOR EACH OUTFALL GIVE THE LEGAL DESCRIPTION (ATTACH ADDITIONAL SHEETS AS NECESSARY)
Outfall Number 1 ___ ¼ NO ¼ Sec. 25 T 47N R 2E STC County
Outfall Number ___ ___ ¼ ___ ¼ Sec. ___ T ___ R ___ ___ County
Outfall Number ___ ___ ¼ ___ ¼ Sec. ___ T ___ R ___ ___ County

7.10 FOR EACH OUTFALL LIST THE NAME OF THE RECEIVING WATER
Outfall Number 1 Receiving Water UNNAMED TRIBUTARY TO PERUQUE CREEK
Outfall Number ___ Receiving Water ___
Outfall Number ___ Receiving Water ___

7.20 BRIEFLY DESCRIBE THE NATURE OF YOUR BUSINESS
MANUFACTURING AND TUNNEL EQUIPMENT MAINTENANCE

7.30 Does the discharge(s) for which you are seeking a permit discharge to a combined sewer system? ☐ Yes ☒ No
7.40 Primary SIC Code 1622
7.50 If this application is for a storm water permit, list **any** materials that are stored outside and exposed to storm water. NONE
7.60 Attach a USGS 1" = 2,000' scale map showing the location of the facility in relation to the local road system. Indicate on the map the facility, the receiving stream, the points of discharge and the map section, township and range.
7.70 If this is an existing discharge, submit a summary of pollutants analyzed in the past two years.
7.80 What is the method of domestic wastewater disposal? PUBLIC SEWER
7.90 I certify that I am familiar with the information contained in the application and to the best of my knowledge and belief such information is true, complete and accurate, and if granted this permit, I agree to abide by the Missouri Clean Water Law and all rules, regulations, orders and decisions, subject to any legitimate appeal available to applicant under the Missouri Clean Water Law of Missouri Clean Water Commission.

A. NAME AND OFFICIAL TITLE (TYPE OR PRINT)	B. TELEPHONE NUMBER WITH AREA CODE
C. SIGNATURE	D. DATE SIGNED

MO 780-0795 (09-09)

INSTRUCTIONS

This form must be submitted with the application fee (listed below). Persons with more than one operating location shall obtain a general permit for each location unless other permitting arrangements are allowed by the terms of the general permit. Where multiple discharge points exist at a single operating location, one application may cover all the applicable discharges. **If there are any questions concerning this form, please contact the appropriate regional office (see map available at www.dnr.mp.gov/regions/regions.htm).**

Fees: Land Disturbance (Form G must be included) - $300 (due at application time only)
Ag Chem Fertilizer/Pesticide - $50 due with application for new permits; $50/year while permit is in effect; no fee required with renewal application
Concentrated Animal Feeding Operation, or CAFO - $150 (due at application time only)
General Permit – Other (e.g., Motor Vehicle Salvage, Limestone Quarry, Petroleum Storage.) - $150 due with application for new permits and each year until expiration; $60/year thereafter; no fee required with renewal application.

1.00 Give the name of the specific general permit you are applying for: (e.g., Land Disturbance, Motor Vehicle Salvage.) If you are unsure about the specific name for the general permit, contact the Water Protection Program, Water Pollution Branch at 573-751-6825.

1.10 Fill out either item (a., item (b., or item (c. as applicable.

Each General permit may have specific antidegradation review requirements contained within it. Go to the following Web sites to verify your specific requirements: For MO-G permits visit www.dnr.mo.gov/env/wpp/permits/wpcpermits-general.htm. For MO-R permits visit www.dnr.mo.gov/env/wpp/permits/wpcpermits-stormwater.htm.

Effective Sept. 1, 2008, facilities are required to use *Missouri's Antidegradation Rule and Implementation Procedure.* This document is available on the Web at www.dnr.mo.gov/env/wpp/docs/aip-cwc-appr-050708.pdf. For more information please contact the Department at 800-361-4827 or 573-751-1300.

2.00 Name of facility – by what name is this facility known locally? (e.g., Southwest Sewage Treatment Plant or Oak Hill Mobile Home Park.)

2.10 Give the street address of the facility. If the facility lacks a mailing address, give an accurate geographic description. (e.g., Intersection of Route A and M.)

3.00 Owner – legal name and address of owner.

4.00 Continuing Authority – permanent organization which will serve as the continuing authority for the operation, maintenance and modernization of the facility.

5.00 Operator – name, certificate number of person operating the facility.

6.00 Give name of person at the facility who can be contacted by the Department if necessary.

7.00 An outfall is the point(s) at which wastewater is discharged. For storm water this may be the point(s) where water leaves the property. Outfalls should be given in terms of the legal description of the facility. Sufficient information should be submitted so the outfall may be located by Department staff.

7.10 Receiving stream(s) – the name of the stream(s) to which the discharge is directed and any subsequent tributary until a lake or continuous flowing stream is reached.

7.20 Describe the primary business conducted at this site.

7.30 A combined sewer system is one in which the sanitary and storm sewers are one pipe. In Missouri, parts of Macon, Moberly, Cape Girardeau, St. Joseph, Kansas City, Sedalia and all of the city of St. Louis are on combined sewer systems. To find out information, consult with your municipal public works department or, if in St. Louis, the St. Louis Metropolitan Sewer District (MSD). **If this discharge is to a combined sewer system, it is exempt from storm water permitting requirements. You do not need to file this application if it is for storm water discharges only.**

7.40 List only your primary Standard Industrial Classification, or SIC, code. The SIC system was devised by the U.S. Office of Management and Budget to cover all economic activities. The primary SIC code is that of the operation that generates the most revenue, or, secondly, employs the most personnel. To find the correct SIC code, contact the Missouri Department of Natural Resources at 573-526-6627 or refer to the following Web sites: www.census.gov/epcd/www/naicstab.htm or www.osha.gov/pls/imis/sicsearch.html.

7.50 Please list anything stored outside, including wood pallets, empty storage barrels, waste disposal containers (except for a secured Dempsey dumpster), or **anything** that is a raw material, by-product, or product of your manufacturing activities.

If your facility is listed under any of the following SIC codes or major group codes, and you can certify that no materials are stored outside, then **you are exempt from storm water permitting requirements. You do not need to file this application if it is for storm water discharges only.** This information refers to the first two, first three, or all four numbers of your SIC code listed in 7.40 above. The SIC codes that are exempt from regulations if **no** materials are stored outside are: 20xx-23xx, 25xx, 265x, 267x, 27xx, 283x, 285x, 30xx, 31xx, 323x, 34xx-39xx, and 4221-4225.

7.60 A map showing the facility in relation to the local roads and receiving streams is required. Attach a 1" = 2000' scale U.S. Geological Survey topographic map, which is available from the Department's Division of Geology and Land Survey in Rolla, MO at 573-368-2125.

7.70 If this is an existing discharge, submit a list of pollutants that have been analyzed in the past two years and any laboratory findings.

7.80 Give the method of domestic wastewater disposal, identify the future method if the site is currently undeveloped. If public sewers, give name of sewer agency. If private system with a State Operating Permit, give name of facility and permit number. If other, please describe.

8.00 Signature – all applications must be signed as follows and the signature must be original.
a. For a corporation, by an officer having responsibility for the overall operation of the regulated facility or activity or for environmental matters.
b. For a partnership or sole proprietorship, by a general partner or the proprietor.
c. For a municipal, state, federal, or other public facility, by either a principal executive officer or by an individual having overall responsibility for environmental matters at the facility.

MISSOURI DEPARTMENT OF NATURAL RESOURCES
WATER PROTECTION PROGRAM
FORM G – APPLICATION FOR STORM WATER PERMIT (FORM E MUST BE INCLUDED)
UNDER THE GENERAL PERMIT: LAND DISTURBANCE

A map of the appropriate regional office is available on the department's Web site at dnr.mo.gov/regions/regions.htm.

Name of development
SAK CONSTRUCTION

Phase (Indicate Phase I, II, etc., if applicable.)
PHASE I

Nature of construction activity
LAND DISTURBANCE

Physical location of development (Address, if assigned.)
864 HOFF ROAD, O'FALLON MO 63366

Date construction is to begin
JULY 2010

Total area of site: 7.72 acres

Total area of land to be disturbed: 2.3 acres

Is a department of Natural Resources approved erosion control plan operative in the city or the unincorporated area of the county in which the land disturbance is occurring?
☐ Yes ☒ No

If yes, a letter of approval or a copy of a permit from the local authority is required and must be enclosed for the permit to be issued.
☐ Please check this box if enclosed.

Has a Storm Water Pollution Prevention Plan, or SWPPP, been developed for this site?
(This plan must be developed in accordance with requirements and guidelines specified within the general permit for storm water discharges from land disturbance activities. The application will be considered incomplete if the Storm Water Pollution Prevention Plan has not been developed. Please do not enclose a copy of the plan. A copy of the Storm Water Pollution Prevention Plan may be requested by the department at any time.)
☒ Yes ☐ No

The department requests that a completed Storm Water Pollution Prevention Plan be submitted along with the application if:

☐ The receiving water is Lake of the Ozarks, or
☐ The first classified waterbody is Lake of the Ozarks.

Summarize the measures (Best Management Practices) from the Storm Water Pollution Prevention Plan that will be used to control pollutants in storm water discharges during constructions.
PERIMETER FILTER FABRIC BARRIER, STRAW BALE DITCH CHECK, INLET PROTECTION, TEMPORARY SEEDING + MULCHING, SILTATION BASIN

Summarize Best Management Practices from the Storm Water Pollution Prevention Plan that will remain in place after construction operations have been completed.
PERMANENT SEEDING, VEGETATED SWALE'S, DETENTION BASIN WATER QUALITY UNIT

Describe the nature of the fill material.
FILL MATERIAL WILL BE EXCAVATED FROM ON SITE LOCATIONS SOILS REPORT INDICATES MEDIUM STIFF TO STIFF, LOW AND HIGH PLASTICITY CLAY

MO 780-1408 (03-10)

ATTACH ANY EXISTING DATA CONCERNING SOIL OR QUALITY OF THE DISCHARGE.

Estimate of runoff coefficient of site. 0.68

Estimate of increase in impervious area. ____ % Decrease

Estimate of runoff coefficient upon completion. 0.67

Is the land disturbance within 1,000 feet of:

☐ Water classified in 10 CSR 20-7.031 water quality standards as a public drinking water supply lake (L_1), outstanding national or state resource waters, or streams designated for cold-water sport fishery.

☐ Streams, lakes or reservoirs identified as critical habitat for endangered species as determined by Missouri Department of Conservation and U.S. Fish and Wildlife Service.

Is the land disturbance within 100 feet of waters classified as major reservoirs (L_2) or permanent flow streams (P), except the Missouri and Mississippi rivers, or within two stream miles upstream of biocriteria reference locations as defined in 10 CSR 20, Chapter 7?

☐ Yes ☐ No

Is any part of the area that is being disturbed discharging to a jurisdictional water of the United States?

☐ Yes ☒ No

If **yes**, have you received a CWA, Section 404 Permit for this site from the United States Army Corps of Engineers? (The permit cannot be issued until the site is under a 404 or Nationwide General Permit, if one is required.)

☐ Yes ☐ No

Does the storm water runoff discharge to a sinkhole, losing stream, or any other topographical feature that would be a direct conduit to groundwater?

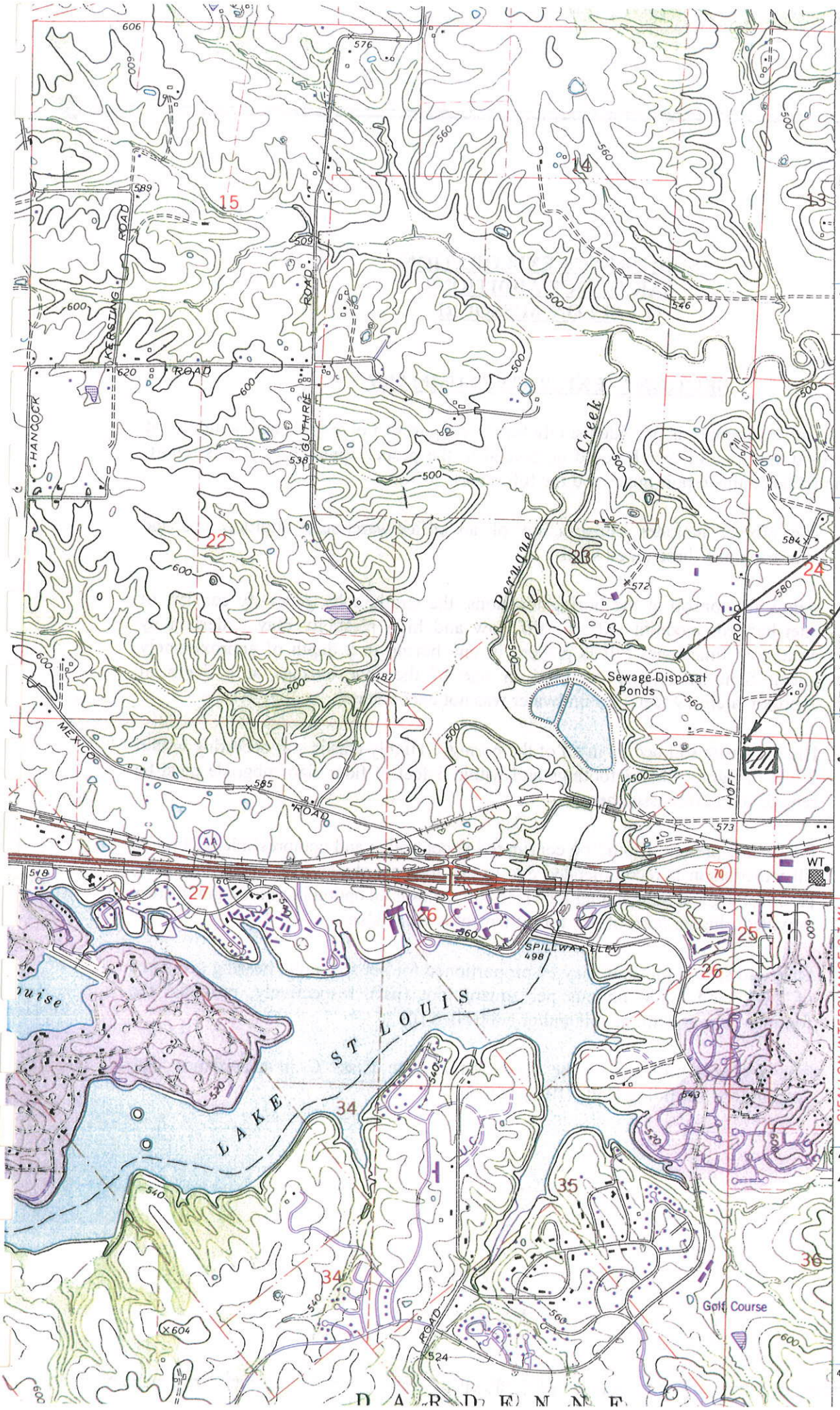
☐ Yes ☒ No

I certify I am familiar with the information contained in the application, that to the best of my knowledge and belief such information is true, complete and accurate, and if granted this permit, I agree to abide by the Missouri Clean Water Law and all rules, regulations, orders and decisions, subject to any legitimate appeal available to an applicant under the Missouri Clean Water Law of the Missouri Clean Water Commission.

Name and Official Title	Telephone number with area code
Signature	Date signed

Note: This form must be submitted with the permit fee ($300), map and *Form E – Application for a General Permit* (780-0795). The form is available on the department's Web site at dnr.mo.gov/forms/780-0795,doc or dnr.mo.gov/forms/780-0795.pdf.

MO 780-1408 (03-10)



WENTZVILL MO QUAD

SECTION 25
TOWNSHIP 47 N
RANGE 2E

SCALE 1"=2000'

K-7

6-17-2010

SUBSURFACE EXPLORATION
SAK OFFICE ADDITIONS
O'FALLON, MISSOURI

SECTION I - EXECUTIVE SUMMARY

The executive summary is provided solely for the purposes of overview, and a number of details are omitted, any one of which could be crucial to the proper application of this report. Any party who relies on this report must read the full report.

- The project includes construction of an office/warehouse addition and the relocation of a three-sided shed.

- Below the topsoil at the boring locations, the stratigraphy generally consists of inter-bedded, medium stiff to stiff, low and high plasticity clay underlain by weathered limestone. Fill is present in one boring to a depth of approximately 4 feet. Sampler refusal occurred in one of the four borings at a depth of approximately 19 feet. Groundwater was not encountered.

- Highly plastic soil occurs in all of the borings. Highly plastic soil occurring within 2 feet of lightly loaded footings and within 3 feet of floor slab subgrade must be remediated as discussed herein.

- Fill, where present, should be considered uncontrolled and compressible. Complete fill remediation is recommended due to the apparent shallow fill depth. However, proof-rolling and remediating localized soft zones is an option in slab-on-grade areas provided a higher level of risk for settlement is acceptable.

- Strip and spread footings may be proportioned for net allowable bearing pressures of 2,000 and 2,500 pounds per square foot (psf), respectively, provided the footings bear on natural soil and/or controlled fill.

- The site soil profile may be classified as Site Class C in accordance with International Building Code (IBC) criteria.

APPENDIX L

2 YEAR SEDIMENT CALCULATION

OK

DAVID MASON & ASSOCIATES
CHICAGO, IL • ST. LOUIS, MO • DALLAS, TX

COMPUTATION SHEETS

PROJECT #: 2010003-00
PROJECT TITLE: 864 HOFF ROAD
CLIENT: SAK CONSTRUCTION

COMPUTED BY: M. DAVIS
CHECKED BY:
DATE: 6-22-2010

2 YEAR SEDIMENT CALCULATION

$A = R K L S C P$

A = COMPUTED SOIL LOSS PER UNIT ACRE (TONS PER AC)
R = RAINFALL FACTOR 220 FOR ST LOUIS REGION
K = SOIL ERODABILITY FACTOR = 0.32
L,S, = SLOPE LENGTH + SLOPE GRADIENT FACTOR = ± 0.5
C = CROPPING MANAGEMENT FACTOR = ± .20
P = EROSION CONTROL MANAGEMENT FACTOR = ± 0.50

$A = 220 \times 0.32 \times 0.50 \times 0.20 \times 0.50$

A = 3.52 TONS PER ACRE

DEVELOPED SITE IS 2.49 ACRES LAND SLOPED

2 YEAR SEDIMENT = 3.52 TONS/ACRE X 2.49 ACRE X 2 YRS.

= 17.5 TONS.
= 35000 LBS

VOLUME OF EARTH @ 100 LBS / CUBIC FT

V = 35,000 LBS ÷ 100 LBS / CUBIC FT

V = 350 CUBIC FT

SEDIMENT BASIN STORAGE = 8641' X (20" + 6") ÷ 12
= 18722 CUBIC FEET
OR AVAILABLE STORAGE > REQUIRED GOOD

SHEET 1-2 OF _____

Universal Soil Loss Equation:

(Wischmeier and Smith)

A = RKLSCP

A = Computed soil loss per unit area (tons per acre)

R = Rainfall factor

# of erosion index units in a normal year's rain. Erosion index is a measure of the erosive force of a specific rainfall

K = Soil erodability factor

erosion rate/unit of erosion index for a specific soil in cultivated continuous fallow on a 9% slope 72.6 feet long

L = Slope length factor

ratio of soil loss from the filed slope length to that from a 72.6-foot length on the same soil type and gradient

S = Slope gradient factor

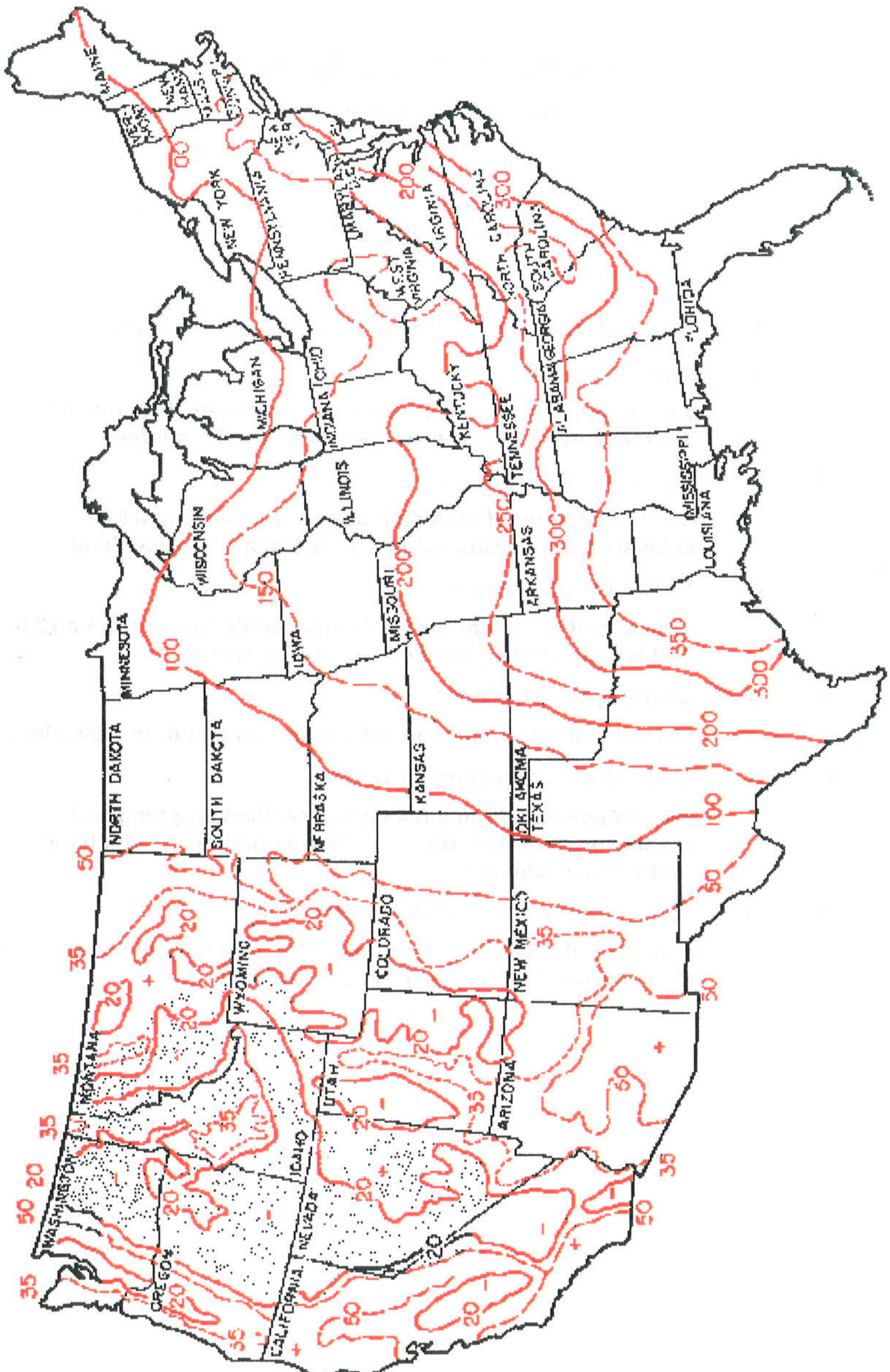
ratio of soil loss from the field gradient to that from a 9% slope

C = Cropping management factor

ratio of soil loss from a field with specified cropping and management to that from the fallow condition on which the factor K is evaluated

P = Erosion control management factor

ratio of soil loss with contouring, strip cropping or terracing to that with straight-row farming, up and down slope



MAINE
VERMONT
NEW HAMP.
MASS.
CONN.
NEW JER.
NEW YORK
PENNSYLVANIA
MARYLAND
WEST VIRGINIA
VIRGINIA
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
FLORIDA
ALABAMA
MISSISSIPPI
LOUISIANA
TENNESSEE
KENTUCKY
OHIO
INDIANA
MICHIGAN
ILLINOIS
WISCONSIN
MINNESOTA
IOWA
MISSOURI
ARKANSAS
OKLAHOMA
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NORTH DAKOTA
MONTANA
WYOMING
COLORADO
NEW MEXICO
ARIZONA
UTAH
IDAHO
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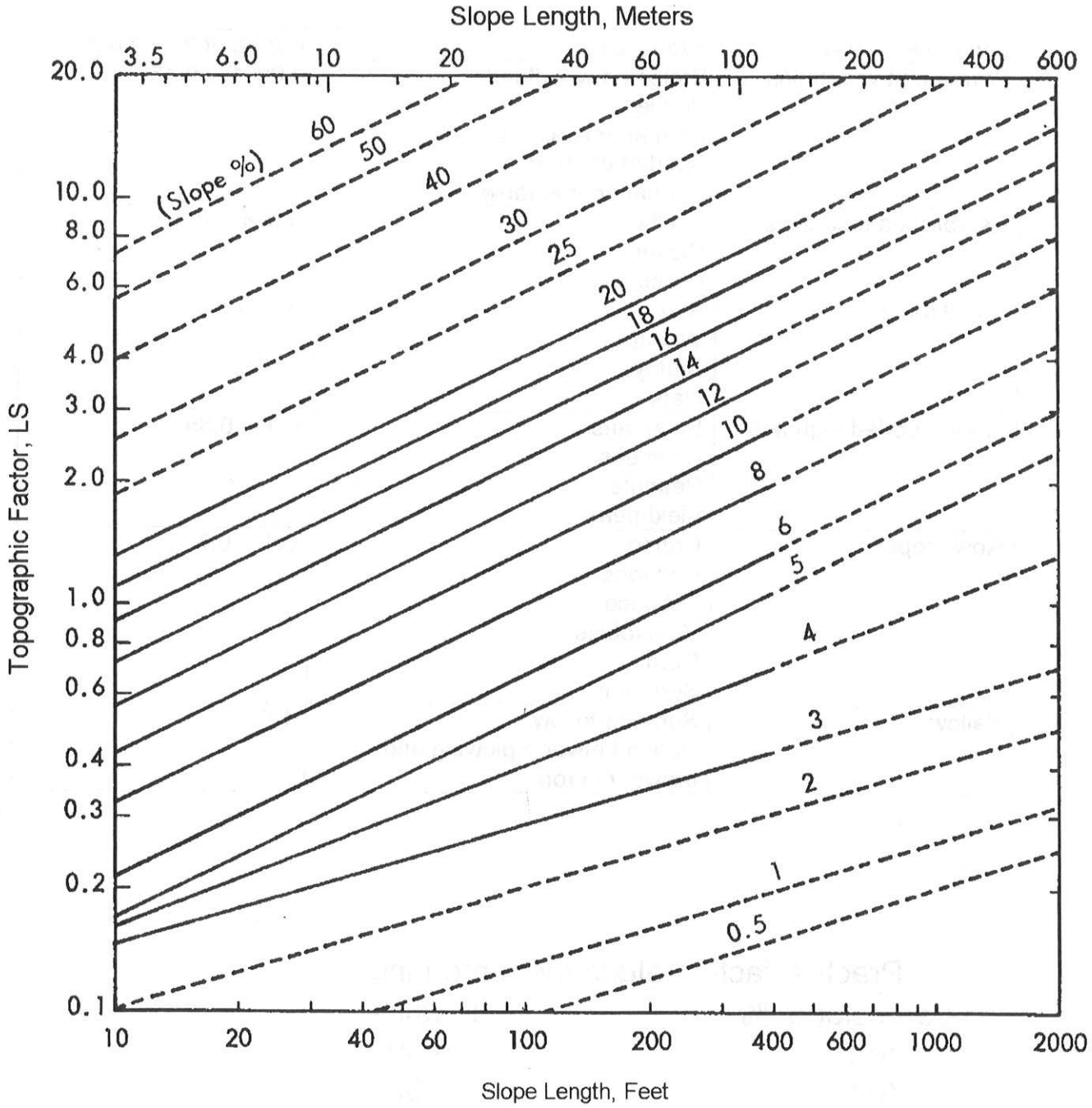

Dashed lines represent estimates for slope dimensions beyond the range of lengths and steepnesses for which data are available

RELATIVE PROTECTION OF GROUND COVER AGAINST EROSION
(in order of increasing C factor)

Land-use groups	Examples	Range of "C" values
Permanent vegetation	Protected woodland Prairie Permanent pasture Sodded orchard Permanent meadow	0.0001 -- 0.45
Established meadows	Alfalfa Clover Fescue	0.004 -- 0.3
Small grains	Rye Wheat Barley Oats	0.07 -- 0.5
Large-seeded legumes	Soybeans Cowpeas Peanuts Field peas	0.1 -- 0.65
Row crops	Cotton Potatoes Tobacco Vegetables Corn Sorghum	0.1 -- 0.7
Fallow	Summer fallow Period between plowing and growth of crop	1.0

Practice factor values for contouring

Land slope, %	P value
1.1 to 2	0.60
2.1 to7	0.50
7.1 to 12	0.60
12.1 to 18	0.80
18.1 to 24	0.90

K Factor, Whole Soil—St. Charles County, Missouri
(SAK Consrutction)